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Article

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International Journal of Management, Economics and Social Sciences (IJMESS)

Provided in Cooperation with:

International Journal of Management, Economics and Social Sciences (IJMESS)

Suggested Citation: Yu, Shu-Yan; Shie, An-Jin (2017) : A model for ageing-home-care service process improvement, International Journal of Management, Economics and Social Sciences (IJMESS), ISSN 2304-1366, IJMESS International Publishers, Jersey City, NJ, Vol. 6, Iss. Special Issue, pp. 185-198

This Version is available at:

<https://hdl.handle.net/10419/173236>

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A Model for Ageing-Home-Care Service Process Improvement

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The purpose of this study was to develop an integrated model to improve service processes in ageing-home-care. According to the literature, existing service processes have potential service failures that affect service quality and efficacy. However, most previous studies have only focused on conceptual model development using New Service Development (NSD) and fail to provide a systematic model to analyse potential service failures and facilitate managers developing solutions to improve the service process. This study proposes a model that integrates service blueprinting and Failure Mode Effect Analysis (FMEA). First, the service blueprint tool was used to analyse potential service failures in the service process. Then, FMEA was employed to diagnose the possible causes and effects of service failures in the model. Finally, we utilised the expert brainstorming method to develop feasible solutions to improve the service process. A case study of the service process used by an ageing-home-care service agency was conducted to demonstrate the applicability of the proposed model. Finally, we summarised the advantages of the proposed model and its implications.

Keywords: Ageing-home-care service, service process, service blueprint, failure models and effects analysis (FMEA)

Advances in medical care and public health have meant that people are living longer. This has resulted in every developed country in the world facing significant difficulties in coping with the accommodation and social needs of an increasingly older population. In response to these demographic problems, many home care service firms must allocate a great deal of resources towards improving the efficiency of their service system in order to satisfy the needs of seniors. Such firms launch improvement initiatives, such as home care service training, service redesign, and Standard Operating Procedures (SOP). However, these actions are still insufficient to close the gaps between the provided services and seniors' needs (Chen *et al.*, 2005, 2006; Chen *et al.*, 2004; Chuang, 2007; Keleher *et al.*, 2007).

According to Chuang (2007) and Bitner *et al.*(2008), a bad service process is one of the most critical factors affecting service system efficiency, as bad service processes decrease the quality and value of the

home care service received by seniors (Bitner *et al.*, 2008; Chuang, 2007; Fitzsimmons & Fitzsimmons, 2011; Gummerus, 2010). Potential service failures in the ageing-home-care service process still exist, which results in greater cost and service quality degeneration. Previous literature on New Service Development (NSD) has argued that a successful service system should experience innovation in the service process to satisfy diverse customer needs. Such research has proposed several innovation models including the strategy-oriented innovation model, the organisational team innovation model, and the user-involvement innovation model (Alam, 2002; Alam & Perry, 2002; Bowers, 1989; Johnson *et al.*, 2000; Scheuing & Johnson, 1989; Stevens & Dimitriadis, 2005).

-Research Questions

Previous studies focus simply on diagnosis analysis (e.g., customer needs analysis, new service generation and screening, new service evaluation, and value co-creation) in the service process, as well as excessively concentrate on discussions of abstract theoretical concepts. Such studies have not yet developed a service innovation model or method that can be applied to improve service processes (Bitner *et al.*, 2008; Chuang, 2007; Jin *et al.*, 2012; Kim & Yoon, 2012; Mele *et al.*, 2010).

Various diagnosis methods have been designed or adopted to improve service processes. Among these are the service blueprint, Failure Models and Effects Analysis (FMEA), Quality Function Deployment (QFD), function analysis, and Root Cause Analysis (RCA; (Bitner *et al.*, 2008; Chuang, 2007; Cohen *et al.*, 1994; Fitzsimmons & Fitzsimmons, 2011; Kim & Yoon, 2012; Wirth *et al.*, 1996). With the exception of service blueprinting, functional methods have their origins in product engineering. For instance, FMEA, which is regarded as a quality improvement tool, is utilised in the identification and prioritisation of the potential failures in product design. RCA is applied to clarify root problems in production processes, and QFD was first used in product design to transform customer needs into new product characteristics. These methods are difficult to apply to service innovation due to the lack of service-oriented concepts.

-Study Significance

Most previous research tends to address service process improvements at a conceptual level. While some tools have been adapted from product engineering for use in service, there is no systematic model for analysing potential service failures and facilitating researchers developing solutions to address these

failures. Against this backdrop, the present study proposes a model for improving the ageing-home-care service process. The proposed model combines the service blueprint and FMEA methods to develop a systematic mechanism to facilitate service process improvements. The first step in the model is to establish a service blueprint to recognise potential service failures in the home-care service process. Then, service failure diagnosis is conducted by FMEA.

The remainder of this paper is organised as follows. The next section presents a conceptual model to demonstrate how the model for the ageing-home-care service process was developed. The practical efficacy of the proposed model is then demonstrated in a case study of the home-care service process for ageing people in Beijing. The paper concludes with a summary of our main findings, their implications, and suggestions for future research.

MODEL DEVELOPMENT

As noted above, previous studies related to NSD have merely contributed discussions on abstract concepts. Furthermore, they lack a generation mechanism for improving the service process. In practice, ageing-home-care service processes have often faced conflicts between the needs of ageing people and the delivered services. In seeking to resolve these conflicts, ageing-home-care needs a model by which to identify potential service failures and develop solutions to improve the service process. Thus, the present study developed a model to improve service processes by integrating service blueprinting and FMEA to solve potential service failures. The proposed model is illustrated in Figure 1. As shown in the diagram, the model has four stages: (i) service process analysis, (ii) service failure diagnosis, and (iii) solution development and evaluation.

The purpose of the first stage is to analyse potential service failures in the service processes. First, the service process is examined through observation by researchers and collection of frontline service staff opinions. Then, a service blueprint is developed to delineate the interactive relationship between customer requirements and employee services in the service process. Finally, potential service failures are identified by service managers. The proposed method at this stage enables service designers to identify potential service failures precisely via a map or flowchart. In the second stage, potential service failures are diagnosed

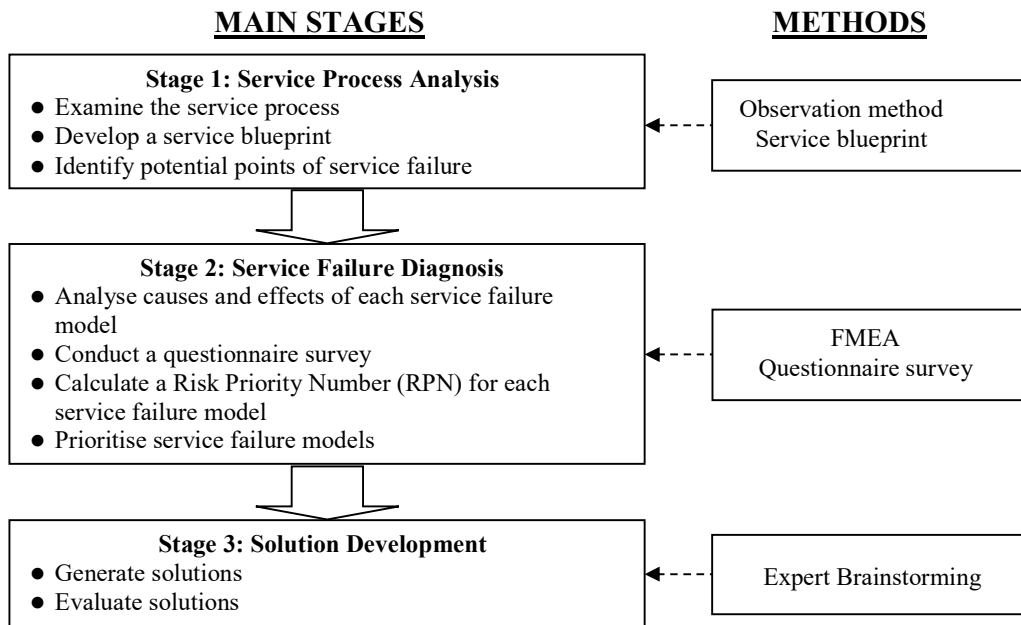


Figure 1. A Service Process Improvement Model for Ageing-Home-Care Service

through a structural analysis of FMEA. First, the causes and effects of the identified potential service failures are analysed by interviewing service managers. The next step requires development of an expert questionnaire based on potential service failures, which is used to survey the frontline service staff. Subsequently, the service failure models are prioritised according to the calculated Risk Priority Number (RPN). Finally, the most critical service failure models are identified. This stage provides managers with the information required to make risk management decisions. The goal is to predict how and where service processes are designed to detect errors and alert staff where there might be service failures (Chuang, 2007; Cohen *et al.*, 1994; Wirth *et al.*, 1996).

In the third stage, solutions are developed and evaluated. First, solutions are developed by service managers through expert brainstorming. Then, all of the proposed solutions are evaluated by managers or experts who are ultimately responsible for the particular service industries. Finally, inventive solutions are prioritised and optimal solutions are selected. In summary, the service process improvement model proposed in this study provides a systematic and scientific approach that enables service designers to

develop inventive solutions to innovate their service process. In the following section, we provide a case study to demonstrate how to use the proposed model to innovate service processes.

RESEARCH CASE

-Case Study Background

Many developed countries are facing the challenges of meeting social needs, providing accommodation, and medically supporting an ageing population. For example, Beijing suffers from the serious population ageing. Nearly a quarter of Beijing's registered residents were 60 years or older by the end of 2014, according to data provided by the Beijing office for senior citizens. The office reported that the number of people aged over 60 in Beijing rose by 174,000 compared with a year earlier, reaching 2.967 million people at the end of 2014 and accounting for 26 percent of the registered population. This trend indicates that Beijing will become one of the areas in the world that is most seriously affected by population ageing (Chhetri *et al.*, 2017; Li *et al.*, 2016; X. Liu *et al.*, 2016b; Pan *et al.*, 2017; Yang *et al.*, 2016).

In response to the ageing population, 6040 community-care agencies were established in Beijing. These provide recreational facilities and healthcare services for senior citizens in nearby community centres. Meanwhile, such agencies also deliver care services to dwellings of ageing people. This is called the “ageing-home-care” service model. However, ageing-home-care services consume huge amounts of resources with regards to nursing manpower, expenditure, and service delivery time, reducing the ability of such agencies to offer ageing-home-care services. However, ageing people like to access care services without leaving their home. The proposed model may help alleviate the resource conflicts over medical equipment and beds in community care agencies. Thus, the ageing-home-care service model has received much attention from governments and academics in order to facilitate the independent living of ageing people (Chhetri *et al.*, 2017; Pan *et al.*, 2017).

This home care service model allows ageing people access to care services without leaving their home by providing services from licensed health-care professionals. This model also enables ageing people who are able to live at home, but unable to access external professional health-care services, to remain within their own personal living environment. However, there are often insufficient resources to meet the needs of clients, which regularly generates conflict between the level of service quality and the requirements of ageing

people (Baron-Epel *et al.*, 2001; Birnbaum *et al.*, 1984; Cohen-Mansfield & Frank, 2008; Cutler, 2007; Francis & Netten, 2004; Jensen *et al.*, 2008; Stone & Reinhard, 2007).

To address this issue, the present study proposed the model for service process improvement described above. Community care agencies in Beijing, China's capital city, offering services in the dwellings of ageing people were selected for a research case study to reveal how the service efficiency of home care may be improved using the proposed model.

To collect valid data, the selection criteria for the participating agencies were: (i) agencies offering nursing manpower where 80-70% or more goes towards home care services, and (ii) agencies are listed in the report entitled "health and social support of the elderly population in the community", meaning that the participating agencies are regarded by the Beijing government to be development-focused (T. Liu *et al.*, 2016a). We contacted 17 ageing-home-care service agencies that are licensed in Beijing. The participating agencies were analysed for their service processes by the research team, then the service staff from the home care service agencies served as investigation subjects.

Application of the Model

-Stage 1: Service Process Analysis

The study utilised an observational method and interviews with frontline service providers to gather practical opinions. Then, a service blueprint for ageing-home-care cases was established, as shown in Figure 2. First of all, customer actions, which are presented above the line of interaction, explain the customer requirements. These involve applying for a home care service, reaching out to the care staff, requiring service (physical care, and assisted feeding, rehabilitation), receiving service, and filling out a satisfaction questionnaire). Then, the front care staff activities, which are located in between the lines of interaction and visibility, illustrate the activities of the frontline staff in providing care services for customers. These include accepting the customer's application, arriving at the ageing person's home, providing services (physical care and assisted feeding), conducting rehabilitation services, and administering a satisfaction questionnaire. The greatest potential service failures were identified in providing physical care services. Finally, the back care staff activities, which are presented under the line of visibility, explain how the logistical staff provide services that support frontline staff activities. Potential service failures are identified in arranging the care

staff, providing physical care services, and evaluating the ageing person's health condition. These potential service failures will be further diagnosed in the next stage.

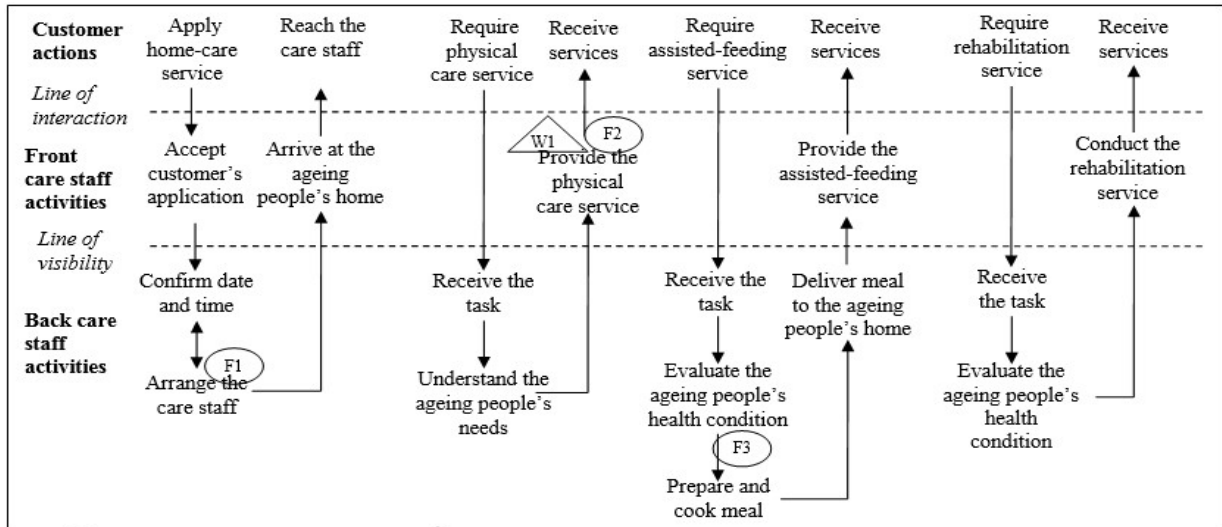


Figure 2. The Service Blueprint for Ageing-Home-Care Service

-Stage 2: Service Failure Diagnosis

For systematic diagnosis of the potential service failures in the home care service model, the scientific diagnosis tool FMEA was employed as follows. First, the service failure models were listed according to the service blueprint developed in the previous stage. The causes and effects of each service failure model were also provided in the same table following an interview with the managers of home care service agencies.

In the second step, an expert questionnaire was developed based on the proposed causes and effects of the service failure models. In the questionnaire, the required measured indices were a severity rating, an occurrence rating, and a detection rating, which were used to analyse each service failure model (see Table 1). For each index, a five-point Likert-type scale was used to measure each service failure model. For instance, a severity rating of 1 implies almost no service failure and 5 implies the most severe service failures. An occurrence rating of 1 implies that there was almost no chance that the service failure model would occur and 5 implies that failure is very likely. A detection rating of 1 implies that the staff has the highest capability to detect the service failure model and 5 implies that they have the lowest capability. A

survey was conducted to collect all of the opinions of the frontline staff and managers from the ageing-home-care service agencies. The survey of the home care agency, which requires leader assistance, was conducted using 32 questionnaires that were sent to the employees and managers of the agency. Among these, one sample was for the leader, four samples were for service managers, and 27 samples were for frontline service staff. The questionnaires asked participants to rate the degree of severity, the probability of occurrence, and the likelihood of detection of each service failure model.

In the third step, the severity rating, occurrence rating, and detection rating for each service failure model were computed by using the accumulated score of those surveyed. The RPN, shown in the last column of Table 1, for each service failure model was calculated using Equation (1).

$$RPN = S \times O \times D \quad \text{eq. (1)}$$

Note: S = severity rating; O = occurrence rating; D = detection rating.

Service failure Model	Service failure model	Failure causes	Severity rating	Occurrence rating	Detection rating	Risk Priority Number (RPN)
F1	Wrong arrangement of human resources	<ul style="list-style-type: none"> ■ Inadequate care staff ■ Lack of experience in new staff 	67	69	79	365,217*
F3	Inappropriate meal arrangement	<ul style="list-style-type: none"> ■ Meals not arranged according to the ageing person's needs and health conditions ■ Lack of a nutritionist 	55	59	73	236,885*
F2	Insufficient physical care service	<ul style="list-style-type: none"> ■ Inadequate care staff ■ Lack of experience in new staff 	57	59	68	228,684*

Table 1. Failure Cause Analysis in the Home-Care Service Example

Finally, RPNs were prioritised to identify the critical service failure models. Higher RPNs imply the need for improvement. Thus, the critical service failure models were wrong arrangement of human resources, inappropriate meal arrangement, and insufficient physical care service. The three service failure models were attributed to inadequate care staff, lack of experience in new staff, meals not arranged according to the ageing person's needs and health conditions, and no nutritionist. Next, we focused on the causes of failure. This enables the development of solutions to improve the ageing-home-care service process in the following stage.

-Stage 3: Solution Development and Evaluation

In order to address the service failure models outlined in the previous stage, solutions for the failure were brainstormed by experts and managers from ageing-home-care service agencies. We collected the opinions of the experts and managers to develop solutions.

To reduce the service failures related to inadequate care staff and the lack of a nutritionist, the first solution proposed emphasises the home care service agency providing educational training for staff members. Less experienced community volunteers in home care services could also be invited to join the training, thus increasing their experience level. In terms of training for home care services, home care staff members should be provided with four hours of training every year. The training should include: (i) an explanation of Alzheimer's disease and related disorders; (ii) how to assist with activities of daily living; (iii) practice problem solving for challenging behaviours; (iv) development of communication skills; and (v) two hours of training on topics related to dementia care for each year of employment after initial training (Minnesota, 2016).

Volunteers can serve as reserve manpower when there is a lack of home care staff. Such methods could be also applied to the training of nutritionists in order to alleviate problems associated with not having one. After we conducted a meeting with the participating agencies, the first solution proposed that an estimated 20% of the assistance with daily living for ageing people and 10% of the office support provided should be arranged to be done by volunteers. These proposed innovative solutions could conserve manpower and increase reserve manpower, alleviating the problem of inadequate care staff.

The second solution proposed suggests that home care service agencies utilise auxiliary tools which result in customers providing self-service, or which use wasted resources, energy, or substances to provide services. For example, online instructional videos should be provided for the education of community volunteers and the families of ageing people. This mechanism could guide such people to perform professional services (such as meal arrangement, physical massage, and rehabilitation) without staff from home care service agencies. In addition, retired nutritionists and home care staff could be reemployed as temporary care staff to provide care services. Such retired staff members have extensive experience in arranging appropriate meals and conducting care services, which can allow for superior service quality.

To reduce service failures resulting from a lack of experience in new staff members and not arranging meals according to the ageing person's needs and health conditions, further solutions were proposed. The third solution proposes the use of a medical care bus with a mobile care service capacity. A mobile clinic, operating theatre, physical and rehabilitation service area, and emergency room could be designed to provide services for community-dwelling elderly people. Ageing people could access these care services in accordance with their needs or in their own time without leaving their community. This solution could provide services to an estimated 300 patients per day in the morning and afternoon (Ajello, 2015), increase service convenience for ageing people, and minimise the number of care staff required.

The fourth solution deals with the application of home care services. Common physical care services (e.g., assistance in bathing and rehabilitation) could be outsourced independently to nursing homes in the ageing person's nearby community. Meanwhile, meal delivery services could also be provided by general restaurants, although meal arrangements for ageing people must follow the suggestions of professional nutritionists or nurses who understand their health conditions. These innovative solutions have the potential to minimise the transportation costs and waiting times for these home care services. In addition, ageing people can be divided based on their needs, age group, health conditions, and medical records to provide wide-spread customised service. For example, ageing people's health conditions can be divided into four levels (e.g., no, mild, moderate, or severe diabetes mellitus) such that the home care service agency can arrange different types of healthy meals in accordance with each ageing person's health condition.

Finally, the four solutions were evaluated by six experts with ten or more years of experience as consultants for ageing-home-care service agencies. The four solutions were prioritised according to three criteria: (i) improving service quality; (ii) solving existing problems; and (iii) providing expected benefits, as proposed by Donabedian (2003) (see Table 2). A five-point Likert-type scale was utilised for this evaluation (1=strong disagreement; 5=strong agreement). The results of this evaluation are illustrated in Table 2. The top three optimal solutions should be implemented to improve the services of home care agencies until all of the conflicts between service quality and ageing people's satisfaction are resolved.

CONCLUSION AND IMPLICATIONS

Evaluation criteria	Generated solution			
	First	Second	Third	Fourth
The solution can improve service quality.	24	24	27	22
The solution can solve existing problems.	23	22	22	24
The solution provides expected benefits to improve the service system.	24	21	22	23
Total	71	67	71	69
Priority	1	4	1	3

Table 2. Solution Evaluation

From the previous literature on ageing-home-care services, it is apparent that existing service processes cannot satisfy the needs of ageing people, which often generates conflict between service quality and the requirements of ageing people. Yet, such studies only focus on diagnosis analysis or surveys of service quality. Therefore, the development of an appropriate model to improve service processes is important for ageing service industries.

To address such issues, the present study proposed a model for improving service processes in ageing-home-care agencies. The proposed model integrates the service blueprint and FMEA methods, enabling service designers to identify potential service failures more easily and to analyse the causes and effects of each service failure model in the service process. The contributions of the proposed model are summarised as follows:

- The model facilitates researchers developing solutions to improve the service processes using service blueprint and FMEA scientific tools.
- The model offers scientific service analysis, a service blueprint, to help ageing-home-care agency managers establish service processes, stimulating such managers to understand potential service failures.
- The model utilises the FMEA method to help researchers and managers of ageing-home-care agencies to use convergent thinking to develop solutions.

The feasibility and advantages of using the proposed model were demonstrated in a case study of ageing-home-care agencies that offer home care services in the dwellings of ageing people in Beijing. The solutions developed using the proposed model to improve service processes are summarised as follows: (i) using reserve manpower (community volunteers) to remedy the problems caused by an insufficient number of service providers in ageing-home-care agencies; (ii) re-employing retired nutritionists and home care staff who can be used as temporary care staff; (iii) providing mobile ageing-care services, such as a mobile clinic, physical and rehabilitation service delivery, and a mobile emergency room; and (iv) using outsourcing strategies, such as using nursing homes, schools, and nearby restaurants in the ageing person's community to deliver care services to clients. In summary, the present study has successfully shown that the proposed model for improving service processes in ageing-care agencies in Beijing can provide a systematic set of feasible solutions to these problems.

Several managerial implications result from this study. The case study demonstrates to managers of ageing-home-care agencies that the proposed model can facilitate systematic improvements of their service systems through a set of scientific approaches. In particular, the service blueprint offers an effective analysis approach that can help managers to represent the entire service process. The service blueprint is different from the production process in manufacturing industries because it emphasizes a service-oriented method with service elements to help managers redesign their service processes. Moreover, FMEA can help managers develop improvement solutions that include solution evaluation from experts. Thus, managers should establish a managerial mechanism to stimulate diversified improvement solutions, enabling service designers to implement continuous improvements in their service processes in ageing-home-care.

Finally, the viewpoints of multiple stakeholders (such as retired nutritionists, senior care staff, the families of ageing people, and the government) should be taken into account when reviewing service failures and developing solutions to improve service processes. Such experiences and opinions can be regarded to be key service quality determinants to improve the effectiveness of the service process improvement model.

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